

PATENT SPECIFICATION

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(54) IMPROVEMENTS IN OR RELATING TO APPARATUS FOR THE TREATMENT OF BURNS

(71) I, MAURICE BLOCH, a British Subject, of 10 Greenacres, Hendon Lane, London, N3 3SF, do hereby declare the invention, for which I pray that a patent may be granted to me, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to a cooling device for the treatment of burns and is concerned particularly with the provision of an appliance for use particularly in the emergency treatment of acute burn injury.

It is well known that, for the treatment of acute burn injury, immediate cooling with cold water or an ice pack results in immediate reduction of pain, reduction in tissue injury by removing heat which would otherwise pass inwardly from the heated skin surface and in a reduction in fluid loss in the area of burn injury. It is not always practicable however to effect treatment in this way, in that a supply of clean and cold water is not immediately available and it is known therefore to employ flexible containers in which, by rupturing an internal seal or an internal fluid container, a fluid, usually water, is mixed with another material to give cooling by an endothermic reaction.

It is an object of the present invention to provide an improved form of apparatus of this kind which can be quickly brought into use when required, for example, for the emergency treatment of burn injuries by surface cooling.

According to this invention, a cooling device for the treatment of burns comprises a flexible container having a fluid-containing compartment and at least one further compartment containing a material or materials which when mixed with the fluid reacts with an endothermic reaction, the fluid being mixable with said material or materials, when required, by breaking internal separating means without rupturing the external walls, wherein said further compartment or each of said further compartments is formed by two sheets of weldable plastics material which are secured together around the periphery of the or each further compartment

and which are spot-sealed together at a plurality of discrete points across their surfaces. This apparatus is brought into use by breaking the internal separating means between the compartments thereby permitting the materials contained therein to mix and to react endothermically. The container can then be applied over the surface of the burn to effect cooling thereof. The spot-sealing between the opposite faces of the further compartment or compartments prevents any wide separation of these faces on filling the compartment with fluid or resulting from any gas which might be released by the interaction between the fluid and the other material or materials. This spot-sealing prevents ballooning of the compartment and thus helps in maintaining an even distribution of the mixture and hence in more uniform cooling. The sealing between the opposite faces also increases the tendency of the container to conform to the contour of the skin surface to which the container is applied.

In stating that the materials react together, there may be a chemical reaction in which the composition of one or more materials is changed. This is not necessary however and use may be made of other endothermic reactions. For example, it is known that many materials when dissolved in water, produce substantial cooling and it is very convenient to use one or more such materials with water as the fluid.

The container most conveniently is completely closed and contains all the necessary materials. However, for large appliances it may be preferred to provide an inlet, e.g. a tube, through which water or other fluid can be introduced when the appliance is to be used.

The aforesaid fluid-containing compartment may be formed by parts of said two sheets separated by a seal from said further compartment or compartments, which seal is capable of being broken without rupturing the external walls apart in the region of the containing compartment and/or by pulling the external walls part in the region of the seal to be broken. Tabs or flaps may be

provided on the external walls along the line of the or each seal to be broken. Such flaps or tabs are preferably located along the line of the or each seal to be broken.

5 Alternatively the fluid-containing compartment may be constituted by at least one sealed fluid-containing bag between said two sheets which form said further compartment or compartments, the bag being of a
10 material rupturable by external pressure through said two sheets.

Typically a container might be of a square or rectangular form in plan and relatively thin. It may be divided into
15 two or more compartments. The spot-sealing between said sheets preferably is regularly spaced over substantially the whole of the or each compartment.

More than one fluid-containing compartment and/or more than one of said further compartments may be provided and arranged so that serial episodes of cooling may be obtained by the successive breaking of seals. Alternatively the duration of cooling may
25 be controlled by using more than one material for mixing with the fluid, the different materials having different reaction times. As an example, one can use finely powdered material to dissolve quickly and
30 material compressed into spheres, pellets, bars or the like to dissolve more slowly.

As one example of a suitable endothermic reaction, ammonium nitrate put into water causes a rapid fall of temperature of the
35 water. It has been found for example that a temperature depression from 26.8°C to -2°C can be obtained within a few seconds of the mixing of the materials. There are many other materials however
40 which produce cooling when mixed with water. In units for use in a tropical climate and which may be stored at a high ambient temperature, larger quantities of the salt may be required to produce the necessary
45 larger fall in container temperature.

The container is conveniently formed of a flexible plastics material, for example using two sheets of flexible material sealed together around their edges and sealed
50 together across the container to form two or more separate compartments and/or holding a sealed fluid-containing bag.

The surface of the container which is applied to the burn, should be of relatively
55 high heat conductivity. In some cases, it may be required to utilise both surfaces for cooling, e.g. when both hands are burned or for burns on the insides of the legs. Commonly, however, only one surface of the
60 container will be applied to a burn and the opposite surface side should preferably be of low heat conductivity to minimise transfer of heat from the outside to the contained cooled fluid. To ensure cleanliness, a protective covering is preferably provided over
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the surface or surfaces of the container to be applied to a burn. These requirements are conveniently met by forming the container of flexible plastics material of relatively high heat conductivity with strippable
70 coatings on both surfaces, these coatings being of thermally insulating material and each constituting also a protective coating. When the device is to be used, the coating
75 is stripped off on one or both faces as required. It is possible however to have separate protective and insulating coatings and, for example, one surface, to be applied to a burn, may be provided with a removable
80 protective cover, for example a layer of tissue paper, which can be pulled off immediately before application to the injured surface of the body. On the opposite surface, an insulating layer may be provided over such a removable coating.
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A layer of fabric, e.g. a wide mesh gauze, impregnated with a medicament may be provided between the strippable protective coating and the flexible plastics material. The container may be irradiated to ensure
90 surface sterility.

If flaps are provided on the container for breaking a seal, the cover or covers may extend over these flaps or the flaps may be arranged to protrude through the cover or
95 covers.

In one form of construction, the container with its protective and/or insulating covers is housed within an outer covering made, for example, of metal foil, which outer
100 covering is sealed or formed so that it can be readily opened or torn off. Preferably a stiffening structural frame, made for example of cardboard, is provided within the outer covering so that pressure will not
105 accidentally be applied through the outer covering onto the container to rupture the aforementioned rupturable seal or seals.

Preferably the flexible container has a fluid-containing compartment or bag at one
110 end of a rectangular sachet formed by two sheets of flexible plastics material sealed together around their peripheries to constitute the further compartment or compartments, the sachet being wound up to form
115 a roll around the fluid compartment or bag and secured by an outer removable covering. In some cases however it may be preferred to fold the flexible container for storage purposes.
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For large area burns, a number of units may be employed, possibly attached together in pairs or in squares of four units. In some cases however it may be preferable to use a large individual unit, for example 12
125 inches square or 12 inches by 18 inches. With large units, to reduce the bulk, it may be preferable to put only solid materials in the unit, and therefore, as previously mentioned, a filling inlet may be provided
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by which a liquid can be put in when the unit is to be used.

A further layer may be provided on the surface of the container between that surface and the strippable coating(s), this layer consisting of wide-mesh gauze, or similar material, impregnated with a medicament. The material, for example, may be impregnated with indomethacin or ketoprofen, or with metronidazole, or with a mixture of these; indomethacin, ketoprofen, or like substances inhibiting prostaglandin synthetase will act thereby to restrict further the effects of burn injury, and metronidazole acts to limit the effects of contamination of the burn area with anaerobic organisms.

The following is a description of one embodiment of the invention, reference being made to the accompanying drawing which is a plan view of a cooling device for the treatment of burns, part of certain outer layers being shown removed.

Referring to the drawing, the device comprises a container 10 formed of two rectangular sheets 11 of flexible weldable plastics material, which sheets are sealed together around their peripheries as shown at 12. The interior space, in some embodiments, may be divided into two or more compartments by continuous seals. In this case one or more compartments may contain a fluid, e.g. water, and one or more further compartments may contain a material, e.g. ammonium nitrate, which reacts endothermically with the fluid. Such a multi-compartment arrangement is particularly convenient if the fluid is to be introduced when the device is prepared for use. This may be done in order to facilitate transport and storage of the devices; they can be stored without water, those required for use being prepared by putting water into one compartment through a closable inlet (not shown). In the construction illustrated however, the fluid is contained within an inner sealed bag 13.

The sheets 11 are sealed together with spot welds 14 regularly spaced over the area thereof, apart from the fluid-containing compartment or compartments or the region containing the sealed bag 13. This spot welding is to ensure that the two sheets cannot move far apart.

The sheets 11 are of a thermoplastics material which is a relatively good heat conductor. Over one or possibly both of these sheets is a layer 15 of wide-mesh gauze impregnated, as previously described, with a medicament such as a mixture of metronidazole with indomethacin or ketoprofen. On top of the layer 15 is a layer 16 of tissue paper and above this is a thermally insulating layer 17. Thermal insulation is provided on both sheets 11 but the intermediate layers 15 and 16 are re-

quired only on that side of the device to be applied to the injured surface.

To use this device, the thermal insulation 17 is stripped off one face, the water bag 13 is ruptured by external pressure so that the water mixes with the salt to produce cooling, the tissue paper 16 is stripped off and the device is then applied to the patient with the exposed layer 15 of medicated gauze on the injured surface.

The spot-sealing of the two sheets 11 together ensures that these sheets cannot move far apart. This ensures that the liquid remains distributed over the whole surface area and also ensures that the device can conform to the shape of the surface to which it is applied.

For transport and storage, the device may be packed in an outer container, e.g. of metal foil, with a cardboard stiffening frame so as to prevent rupture of the water container. It is convenient however to roll the device around the water bag 14 which is at one end of the container, the roll being held by an outer wrapper, e.g. of paper. This reduces the bulk for transport and storage. In some cases, it may be preferred to transport and store the devices without water; for this purpose, a closable filler tube may be provided for putting water into the fluid compartment which is more conveniently formed, in this case, by sealing a region between the two sheets 11 rather than by using a separate internal bag 13.

WHAT I CLAIM IS:—

1. A cooling device for the treatment of burns comprising a flexible container having a fluid-containing compartment and at least one further compartment containing a material or materials which when mixed with the fluid reacts with an endothermic reaction, the fluid being mixable with said material or materials, when required, by breaking internal separating means without rupturing the external walls, wherein said further compartment or each of said further compartments is formed by two sheets of weldable plastics material which are secured together around the periphery of the or each further compartment and which are spot-welded together at a plurality of discrete points across their surfaces.

2. A device as claimed in claim 1 wherein said fluid-containing compartment is formed by parts of said two sheets separated by a seal from said further compartment or compartments, which seal is capable of being broken without rupturing the external walls by pressure on the fluid-containing compartment and/or by pulling the external walls apart in the region of the seal to be broken.

3. Apparatus as claimed in claim 2 wherein tabs or flaps are provided on the external walls along the line of the or each

seal to be broken.

4. A device as claimed in claim 1 wherein the fluid-containing compartment is constituted by at least one sealed fluid-containing bag between said two sheets which form said further compartment or compartments, the bag being of a material rupturable by external pressure through said two sheets.
- 10 5. A device as claimed in any of the preceding claims wherein said further compartment or compartments are square or rectangular.
- 15 6. A device as claimed in any of the preceding claims and having more than one fluid-containing compartment and/or more than one further compartment and arranged so that serial episodes of cooling may be obtained by successive breaking of seals or rupturing of fluid-containing bags.
- 20 7. A device as claimed in any of the preceding claims wherein said fluid is water and wherein the further compartment or compartments contain a material or materials which produce cooling when mixed with water.
- 25 8. A device as claimed in any of the preceding claims and formed of two sheets of flexible plastics material sealed together around their edges wherein strippable protective coatings are provided over the outer faces of each of the two sheets.
- 30 9. A device as claimed in claim 8 wherein the protective coatings eg. are formed of thermally insulating material.
- 35 10. A device as claimed in any of claims 1 to 7 and formed of two sheets of flexible plastics material sealed together around

their edges wherein a thermally insulating coating is provided over the outer face of one sheet and a strippable protective coating over the outer face of the other sheet.

11. A device as claimed in any of claims 8 to 10 and having, between the flexible plastics material and the strippable protective coating, a layer of fabric impregnated with a medicament.

12. A device as claimed in claim 11 wherein the fabric is a wide-mesh gauze.

13. A device as claimed in any of the preceding claims and having an outer removable protective covering including a stiffening frame.

14. A device as claimed in any of claims 1 to 12 and having a fluid-containing compartment or bag at one end of a rectangular sachet formed by two sheets of flexible plastics material sealed together around their peripheries to constitute the further compartment or compartments, the sachet being wound up to form a roll around the fluid compartment or bag and secured by an outer removable covering.

15. A device as claimed in any of the preceding claims and having a closable inlet tube for filling the fluid-containing compartment.

16. A cooling device for the treatment of burns substantially as hereinbefore described with reference to the accompanying drawing.

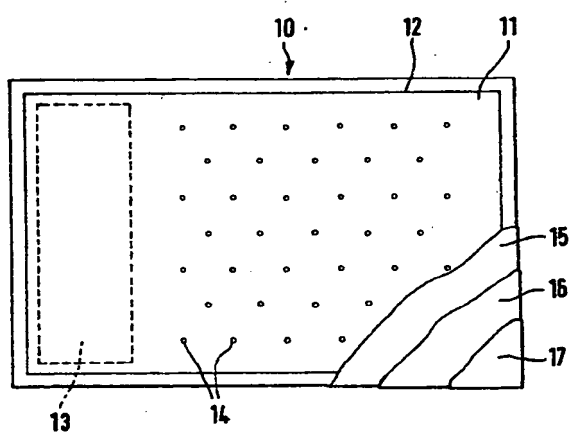
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1598461

COMPLETE SPECIFICATION

1 SHEET

*This drawing is a reproduction of
the Original on a reduced scale*



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